

## Logistics Reduction: Multipurpose Crew Transfer Bag (LR-MCTB)

Completed Technology Project (2014 - 2022)



## Project Introduction

The Advanced Exploration Systems (AES) Logistics Reduction (LR) project Multipurpose Cargo Transfer Bag (MCTB) project focuses on repurposing cargo transfer bags for on-orbit outfitting. The MCTB task converts cargo transfer bags into useful crew items or life-support augmentation on-orbit after they have provided their primary logistics function. Reuse of the MCTB logistics carriers prevents the need to fly additional items. By repurposing MCTBs, dedicated crew items do not have to be launched and the overall launch mass is decreased. For non-LEO missions, the vehicle interior habitat volume will be relatively fixed. MCTBs will enable this volume to be used more effectively through reuse and rearrangement of logistical components. MCTBs reduce habitation trash generation rates.

The MCTB team worked with the ISS Vehicle Office and JSC Acoustics Office to determine the optimal material layup of an acoustic MCTB to absorb the sound of the ISS treadmill. Located in Node 3 on ISS, the treadmill reaches the noise hazard limit of 85 dBA when operated at high speeds. As such, the treadmill has been added to the Noise Hazard Inventory, and hearing protection has become mandatory when the treadmill is used above 10 mph per the Noise Constraint Flight Rule. An acoustic MCTB was designed with a material layup specifically designed to absorb the sound generated by the treadmill. Four Acoustic MCTBs were designed, fabricated, and delivered in the first half of 2015 and launched to ISS on Orbital's fourth cargo resupply mission (Orb-4) in December 2015. After serving their primary purpose of carrying logistics, the MCTBs were reconfigured to flat panels and attached in a dual layer to two walls in proximity to the treadmill. They reduced the treadmill noise by 2-3 dBA and the general Node 3 acoustic levels were reduced even when the treadmill was not being used. The Acoustic MCTB ISS technology demonstration started in September 2016 and will continue until the MCTBs' surfaces become soiled and visually unacceptable as determined by crew preference. The MCTB's are still in use in FY22. Future work could include development of a low-mass crew quarters comprised of MCTBs planned as a possible temporary configuration for the early Gateway missions prior to the arrival of the habitation module.

## Anticipated Benefits

Test data with the flight Acoustic MCTBs indicated a decrease in the sound level by 2-3 dBA. Since dBA is measured on a logarithmic scale, a 3 dBA reduction is a halving of the sound energy. The MCTBs also reduced general cabin noise even when the treadmill is not being used.

For non-LEO missions, the vehicle interior volume will be relatively fixed. MCTBs will enable this volume to be used more effectively through reuse and rearrangement of logistical components. Reuse of cargo bags improves acoustics, habitation functionality, and reduces the packaging trash after the cargo bag contents are utilized.



Fit check of the AMCTB prototype as an 'acoustic blanket' in the JSC Space Vehicle Mockup Facility (building 9) ISS Node 3 mockup

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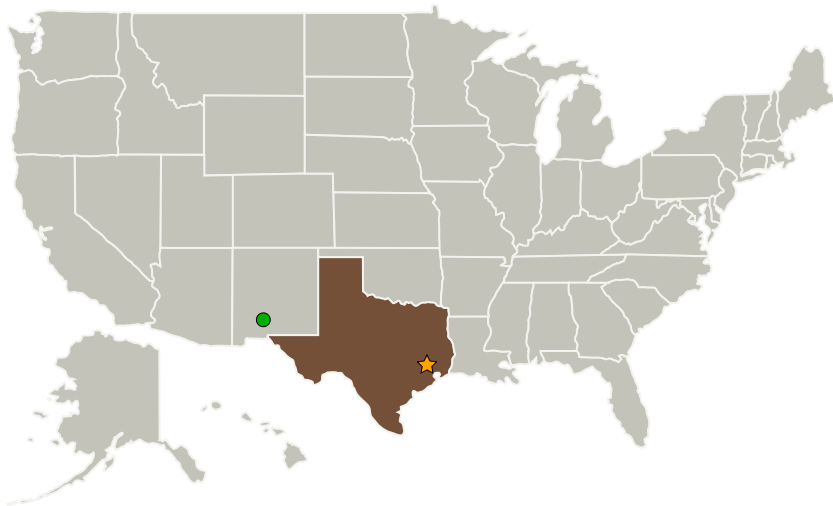
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
● White Sands Test Facility(WSTF)	Supporting Organization	NASA Facility	Las Cruces, New Mexico

Co-Funding Partners	Type	Location
Materials Modification, Inc.	Industry Small Disadvantaged Business (SDB)	Fairfax, Virginia

## Primary U.S. Work Locations

Texas

## Organizational Responsibility

**Responsible Mission Directorate:**Exploration Systems  
Development Mission  
Directorate (ESDMD)**Lead Center / Facility:**

Johnson Space Center (JSC)

**Responsible Program:**

Exploration Capabilities

## Project Management

**Program Director:**

Christopher L Moore

**Project Managers:**Shelley A Baccus  
Melissa K Mckinley**Principal Investigator:**

Shelley A Baccus

**Co-Investigator:**

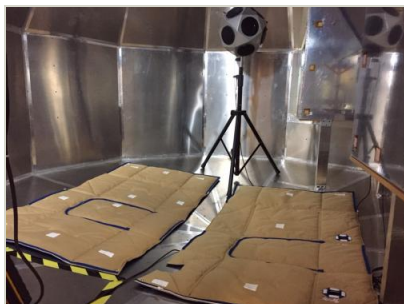
Christopher S Allen

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## Images

**Acoustics MCTB**

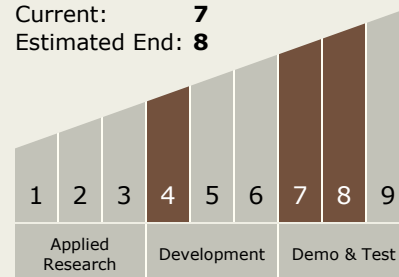
Acoustic T-60 Reverberation Test performed on the Acoustic Multipurpose Cargo Transfer Bags (AMCTBs) June 22-23, 2015 (<https://techport.nasa.gov/image/143449>)

**MCTB Concept of Operations**

Fit check of the AMCTB prototype as an 'acoustic blanket' in the JSC Space Vehicle Mockup Facility (building 9) ISS Node 3 mockup (<https://techport.nasa.gov/image/143448>)

**Technology Maturity (TRL)**

Start: **4**  
Current: **7**  
Estimated End: **8**

**Technology Areas****Primary:**

- TX07 Exploration Destination Systems
  - TX07.2 Mission Infrastructure, Sustainability, and Supportability
    - TX07.2.1 Logistics Management

**Target Destinations**

Earth, The Moon, Mars

**Supported Mission****Type**

Planned Mission (Pull)